The Sophisticated Kind Theory

Matt Teichman

Abstract

Generic sentences are commonsense statements of the form '*F*s are *G*,' like 'Bears have fur' or 'Rattlesnakes are poisonous.' Kind theories hold that rather than being general statements about individual objects, they are particular statements about kinds. This paper examines the standard objections against the kind theory and argues that they only apply to the most simplified version of the theory. The more sophisticated version, which has received little discussion in the literature in spite of having been formulated concurrently with the simple version, is immune to this standard battery of objections. After discussing four distinctive features of generic sentences, the paper then presents a modernized extension of the sophisticated kind theory which explains the presence of these features. Although the choice between a kind theory and the more standardly accepted adverbial quantificational theory is complex, these considerations suggest that the two approaches are at least deserving of equal consideration for the purposes of natural language semantics.

1 What Are Generic Sentences About?

Generic statements are some of the most intriguing statements we make. They are so central to our commonsense reasoning that every attested human language can express them (Dahl, 1995; Cohen, 2013), and they are the discursive tool through which we impart mastery of our most basic concepts to children (Gelman *et al.* , 2015). Yet despite their centrality in human life, they have been challenging for philosophers to analyze. On the one hand, precisely stating their truth conditions requires nontrivial logical machinery. On the other, generic sentences with the same surface form exhibit a surprising amount of variation in their exact meaning, making it difficult to provide a fully compositional semantic theory that captures these variations across different contexts.[1]

[1] 'Fully compositional' will mean a theory that maps the syntactic structure of a given sentence to its truth conditions, via nothing more than definitions of each individual word in the sentence, and a small number of very

In English, generics have the surface form '*F*s are *G*.'[2] At the intuitive, pre-theoretical level, they are loose general statements. They are most naturally made in the realm of biology, artifacts, cultural conventions, or cultural stereotypes, but are used in connection with a wide variety of other topics as well:

(1)
a. Chicago winters are cold. — *the weather*
b. Polar bears are vicious. — *the wild*
c. Engines have many parts. — *engineering*
d. Dutch people love bikes. — *culture*
e. Policemen have uniforms. — *cultural conventions*
f. Philosophy classes are difficult. — *activities*
g. Abortions are wrong. — *ethics*
h. Visual experiences are veridical. — *epistemology*

Generics raise substantial philosophical questions. How can they be generalizations, but retain their truth in the face of counterexamples? Are they objectively true or false? Do they have truth conditions, or are they simply expressions of one's endorsement of some pattern of inference—the way some (Veltman, 2005) have argued is the case for natural language counterfactuals?

This paper will focus on a more basic question,[3] which must be answered in order to arrive at a satisfying account of their truth conditions: what is the logical form of a generic statement? Although many philosophers have meant many different things by *logical form*, this paper will adopt the notion of logical form employed by natural language semantics, first proposed in May

general composition rules that specify how the denotation of any syntactic constituent is to be derived from the denotations of its subconstituents. Paradigmatic formulations of this kind of theory can be found in Montague (1973), Gamut (1991), and Heim & Kratzer (1998).

2 They can also take the form 'The *F* is *G*,' 'An *F* is *G*,' or even 'Your *F* is *G*.' Sentences with these surface forms are very close in meaning to sentences of the form under discussion, but they differ in a number of subtle ways which place them beyond the scope of this paper. My focus, therefore, will be on sentences of the form '*F*s are *G*.' Here I take my cue from (Carlson, 1977a,b) which focuses on the bare plural generic as the paradigmatic case, in part because that is the only surface form in English that gives rise to a generic interpretation unambiguously. ('The dog has four legs,' for instance, also has an interpretation on which it's about a specific dog that is under discussion.)

3 Though interested parties can consult section 5, which starts in on answering some of these bigger questions.

(1977) and assumed in standard textbooks such as Heim & Kratzer (1998). This is the modern iteration of the distinction between deep structure and surface structure in Chomskian phrase structure grammar (Chomsky, 1965), and is a way of capturing what are called multiple levels of representation, or certain regular patterns of divergence between the order in which parts of a sentence are interpreted and the order in which they are pronounced. The model works as follows: a complete syntactic structure is constructed, at which point the construction process has the ability to fork. The structure can undergo some changes that are interpreted but not pronounced, and other changes that are pronounced but not interpreted. The one prong of the fork is referred to as logical form (LF), and the other is referred to as phonetic form (PF).

Determining the logical form of some English sentences, in this sense of the term *logical form*, is not simply a matter of telling a story about what their truth conditions are. It also involves telling a plausible story about how those truth conditions are derived. What are the logical building blocks out of which these sentences are built? What about those building blocks and the way they are combined *leads to* the truth conditions they have? Adding these additional constraints on what counts as a satisfactory analysis is important because it gives a definite, falsifiable meaning to claims about whether a given kind of sentence contains or does not contain a given logical operator. It allows for the hypothesis that there can be more to an English sentence than what appears on the surface, while at the same time setting concrete constraints on how far what is 'really present' in that sentence can diverge from its surface appearance.

Kind theories hold that generic statements of the sort discussed in (1) are only directly about kinds. Should they turn out to be correct, generic statements would not in fact be generalizations at all. To take a particular example, a kind theory would have it that bears are furry just in case bear-kind is characterized by furriness.[4] One might wonder what exactly bear-kind is supposed to be. And there are many ways we could answer that question: perhaps bear-kind is the mereological sum of all bears, perhaps it is the abstract ideal bear, or perhaps it is the set of all our expectations about bears. Kind theories leave those questions open, but they make two assumptions about what

[4] I will use this 'characterized by' expression as a loose, intuitive catch-all term for the idea that certain kinds have inherent, characteristic features which may defeasibly fail to obtain in isolated cases.

kinds are: first, that a kind has members, and second, that the kind is a distinct entity from any of its members.[5] Beyond those two assumptions, they hold that whatever kinds may be, a generic statement is only directly a statement about a kind.

The dominant semantic theory of generic statements holds that rather than being particular statements about kinds, they are general statements involving an implicit quantifier.[6] There are a number of possibilities as to what they might be generalizations over, but since the received view is that they are adverbial generalizations (Lewis, 1975), rather than determiner generalizations, they will most likely turn out to be generalizations over events, temporal parts of objects, moments, situations, or variable assignments. According to a quantificational theory, generics share the logical structure of any other general statement; the only two differences are a) that the quantifier they contain is implicit and unpronounced and b) that this quantifier has an intensional meaning very roughly on the order of 'all normal.' Since this quantifier is synonymous with no overtly pronounced word, it is called *Gen*.

(2) a. **Quantificational Theory (Determiner Version)**

Fs are G : true iff $Gen\ x\ (F(x))(G(x))$[7]

Paraphrase: Fs are G just in case *Gen*-many Fs are G.

b. **Quantificational Theory (Adverbial Version)**

Fs are G : true iff $Gen\ x,s\ (F(x)(s))(G(x)(s))$

Paraphrase: Fs are G just in case *Gen*-many situations involving Fs are situations involving their being G

5 Most kind theories (Carlson, 1977a; Chierchia, 1998), with the notable exception of Liebesman (2011), make the further assumption that kinds are ordered by a *subkind* relation.

6 A quantificational analysis of *indefinite* generics was first suggested in Heim (1982), and first proposed as a general theory for generics as such in Farkas & Sugioka (1983), since which time it has more or less held sway in the literature: semantic theories that have become the industry standard such as those of Krifka *et al.* (1995) and Asher & Pelletier (1997) all argue generic sentences to have quantificational purport.

7 For those unfamiliar with generalized quantifier notation (Barwise & Cooper, 1981), a formula in generalized quantifier logic can be read in the following way: for any quantifier Q, read '$Qx\ (F(x))(G(x))$' as '*Q-many* Fs are G.' So '$Every\ x\ (F(x))(G(x))$' can be interpreted as 'Every F is G,' '$Most\ x\ (F(x))(G(x))$' can be interpreted as 'Most Fs are G,' and so forth. Different quantifiers are defined in different ways, but all of these definitions understand them as relations between sets. So the statement '$Every\ x\ (F(x))(G(x))$' is true just in case the set of Fs is a subset of the set of Gs, and the statement '$Most\ x\ (F(x))(G(x))$' is true just in case the intersection of the set of Fs and the set of Gs is greater in cardinality than the intersection of the set of Fs and the set of non-Gs.

c. **Kind Theory (Sophisticated Version)**

Fs are G : true iff $(PM(G))(F\text{-}kind)$

According to the quantificational theory, 'bears are furry' contains the unpronounced quantifier *Gen*. If *Gen* is a determiner quantifier, then that sentence says that *Gen*-many bears are furry. If *Gen* is an adverbial quantifier, then that sentence says that *Gen*-many situations in which something is a bear are also situations in which that thing is furry. According to the kind theory, the sentence states that bear-kind is furry′, where *furry* is a predicate applicable to individual objects, such as bears, *furry*′ is a predicate applicable to kinds, such as bear-kind. *PM* is a predicate modifying operation that shifts individual object predicates to kind predicates; it takes the indvidual object predicate *furry* as an argument and yields something which can take the kind-referring expression *bears* as an argument.[8]

For the sake of convenience, the version of the sophisticated kind theory articulated in this paper will assume that *PM* is a phonologically unrealized element in the syntactic tree located above the predicate in object position. Although no attempt will be made to adduce syntactic evidence for the existence of *PM* here, any fully compositional semantic analysis of generic statements should view itself as answerable to the best available information about natural language syntax. So although the sophisticated kind theory is potentially subject to revision in light of whatever future syntactic data may become available, the very same goes for adverbial quantificational analyses, which have yet to present any specifically syntactic evidence for the existence of *Gen*. So from a syntactic point of view, the two approaches seem like they are at least on roughly comparable footing. Furthermore, should the LF assumed by the sophisticated kind theory prove syntactically untenable in the long run, there is always the option of making *PM* into a type shifting rule.

Mounting a full frontal challenge to the adverbial quantificational theory of generics would be too ambitious a task for a single paper, because there are too many complicated variables at play,

[8] This operator is typically referred to in the literature as *Gn*. So as to avoid confusion with *Gen*, this paper will follow terminology of Fara (2001) and call it the predicate modifier (*PM* for short).

including the difference between generic statements and habitual statements, what gets to count as an adverbial quantifier, and whether any attested adverbial quantifiers give rise to drastically different truth conditions across a range of predicates, the way generic statements infamously do.[9] Furthermore, the adverbial quantificational theory has certain prima facie advantages, such as its potential to give a unified account of indefinite and bare plural generics that is easy to situate with respect to what we know about the indefinite article.[10] Therefore, the discussion to follow will remain agnostic as to whether an adverbial quantificational analysis or a kind-theoretic analysis is to be preferred.

What this paper will argue, rather, is that kind theories and adverbial quantificational theories are at the very least on a par when it comes to describing the canonical data, and that the kind theory is particularly well-positioned to explain four key semantic features of generic statements, to be discussed in the second half of the paper.

2 Sophisticated vs. Simple Kind Theories

It is reasonable to wonder whether generic statements just involve ordinary predication. Why not argue instead that the noun phrase in subject position of a generic sentence is simply the name of an ordinary particular object, rather than the name of some new variety of object the theory calls a kind? Then the predicate would apply to it in the ordinary way, rendering the predicate modifying operation unnecessary:

(3) **Simple Kind Theory**

Fs are G : true iff $G(F\text{-}kind)$

[9] There are, however, a few small challenges one can raise against the adverbial quantificational theory, independently of anything that will be discussed here, which the author intends to explore in future work.

[10] It should be mentioned that this advantage is still hypothetical, because existing attempts to situate indefinite generics with respect to what we know about the indefinite article get their truth conditions wrong, and analyses that come closer to getting their truth conditions right fail to situate indefinite generics with respect to what we know about the indefinite article or bare plural generics. But the extant work in this area (Heim, 1982; Greenberg, 2003; Krifka, 2013) is at least promising and suggestive.

Certain authors, notably Liebesman (2011), advocate a simple kind theory. However, this paper will adopt the sophisticated kind theory in (2-c) rather than the simple kind theory in (3), principally for two reasons. The first is a basic philosophical worry: it is intuitive what it means for a creature like a bear to be furry. But whatever metaphysical theory of kinds we end up choosing, it is far from clear what it would mean for a *kind* to be furry. Although we have not defined the predicate modifier as of yet, by including it as part of our semantic analysis, we at least acknowledge that if kinds can be furry, it is only in a very different sense of the term.

A second good reason for rejecting the simple kind theory is Carlson's original one,[11] which is that one needs some sort of logical operator to account for generic sentences with bound variable interpretations:

(4) Ants know how to get back to their nests.

Sentences such as (4) reveal something important about generic sentences: any property that applies to individual objects can characterize a kind. But without an additional operation that maps properties of individual objects to properties of kinds, there is no way to ensure that sentence (4) receives the interpretation on which each ant is paired with *its own* nest, rather than some other nest. Think of it this way: suppose we transform the sentence 'Andy knows how to get back to his nest' into the property of knowing how to get back to one's own nest. The standard way to represent the property of knowing the way back to one's own nest is as that sentence, except with the same variable in place of the noun and pronoun: 'x knows how to get back to x's nest.' *Applying* that property to ant-kind yields the statement that ant-kind knows the way back to its own nest. But the truth conditions of sentence (4) are *not* that ant-kind know the way back to its own nest. It isn't as though *ant-kind* even has a nest; different ants have different nests. To rephrase the argument in terms of lambda abstraction, the modern formal device for turning a sentence into a property, there is no other way for this analysis to go:

(5) $\lambda x \,.\, \mathit{knowsLocationOf}(x, \mathit{nestOf}(x)))(\mathit{ant\text{-}kind})$

[11] See Carlson (1977a), chap. 5.

$= knowsLocationOf(ant\text{-}kind, nestOf(ant\text{-}kind))$ *by β-conversion*

= true iff ant-kind knows the location of its own nest.

Thus, a simple kind theory is forced to make undesirable predictions about what sentences like (4) mean. To get the meaning right, we need an additional operator that can map the property of knowing how to get back to one's nest to another property which is a) applicable to kinds, and b) capable of pairing individual ants with their nests.[12] So there are both philosophical and semantic reasons to think that a sophisticated kind theory is the only viable option.[13]

The remainder of this paper will be devoted to arguing that the kind theory is on much stronger footing than is standardly assumed. Although it is difficult to make a decisive case for a kind-theoretic approach over an adverbial quantificational approach, there is also no decisive case to be made in favor of an adverbial quantificational approach. At a minimum, the two approaches should therefore be explored in tandem, until the benefits of one are shown to outweigh the benefits of the other. A bit more boldly, it shall be argued that the kind theory is particularly well placed to account for some of the most puzzling characteristics of the statements under consideration.

3 Criticisms of the Kind Theory

The kind theory rose to prominence in the late 70s, but now faces some standard objections after having been displaced. Before moving onto a positive proposal, we begin with some indication as to why these criticisms leave the prospects for a kind theory of generics untouched.

3.1 Comparatives

One criticism of the kind theory relates to its predictions vis-à-vis comparatives and equatives:[14]

12 Section 5 will give a model-theoretic semantics for *PM* that has these two desirable features, among others. Without going into the details here, the rough idea is that kinds denote processes that produce things, and that the predicate modifier lifts an object-level property F to the property of being a process which makes things that are F.

13 Leslie (2015) provides a battery of further semantic arguments against a simple kind theory.

14 See Nickel (2010a).

(6) a. Horses are taller than cows. *comparative*

b. Cows are taller than horses. *comparative*

c. Cows are (exactly) as tall as horses. *equative*

Cows and horses are about 5 feet tall, on average. Horses exhibit greater variation: the shortest horses are shorter than any cow and the tallest horses are taller than any cow. Nickel writes that (6-a) and (6-b) are both false. But interestingly, he also has the intuition that (6-c) is false. Horses and cows may have the same *average* height, but their heights have different statistical distributions: the histograms tabulating the respective heights of the two populations would not line up. Perhaps, in that case, (6-c) is false.[15] As Nickel observes, this assignment of truth values is logically ruled out in ordinary comparatives:

(7) a. Evelyn is taller than Vivian.

b. Vivian is taller than Evelyn.

c. Evelyn is (exactly) as tall as Vivian.

Unlike sentences (6-a)-(6-c), if (7-a) and (7-b) are both false, then (7-c) must be true, given that *taller than* is a linear order.

How is this a problem for the kind theory? To the author's knowledge, no kind theorist has yet proposed a fully compositional semantics for comparatives.[16] However, Nickel conjectures that a kind theory of comparatives would have to go like this. Since bare plural noun phrases are proper names of kinds, the logical form of a generic comparative should be akin to that of an ordinary comparative:

[15] It is not easy to have clear intuitions about these cases, which probably means that more experiments need to be done on these data. Before coming to share Nickel's intuitions, it is first necessary to think one's way into the scenario for a while.

[16] Nickel attributes the account below to Krifka *et al.* (1995), but that article only discusses generic statements like (8-a), not generic comparatives like (8-b):

(8) a. Fs get bigger as you head north.

b. Fs are bigger than Gs.

(9) a. a is G : *true iff* ***G(a)***

b. Fs are G : *true iff* ***G(F-kind)***

c. a is bigger than b : *true iff* ***size(a)*** $>$ ***size(b)***

d. Fs are bigger than Gs : *true iff* ***size(F-kind)*** $>$ ***size(G-kind)***

According to Nickel, the difficulty with such a treatment of generic comparatives is that it predicts (6-c) to be necessarily true if (6-a) and (6-b) are both false. But if Nickel's intuitions are correct, this inference pattern does not hold for generics, because two kinds can 'differ' in height without 'tying' in height.

Without coming down definitively one way or the other on the robustness of these data, which have yet to be fully tested, it may be observed that even if Nickel's judgments are vindicated by future experiments, they will only pose a problem for the simple kind theory—not for the sophisticated kind theory. As discussed earlier, there is ample independent reason to reject a simple kind theory anyway. The basic reason these observations are unproblematic for the sophisticated kind theory is that given its additional logical structure, it has no commitments one way or the other regarding the entailment from the falsity of (6-a) and (6-b) to the truth of (6-c). If that is discovered to be a correct entailment, it can be modelled by making one set of assumptions about the predicate modifier, and if it is discovered not to be, that fact can be modelled by making a different set of assumptions about the predicate modifier.

The sophisticated kind theory under present consideration posits a predicate modifier for monadic predicates, much like its earlier cousin in Carlson (1977a). To accommodate constructions featuring bare plural noun phrases in object position, the analysis will require either a new predicate modifier that shifts dyadic object relations to dyadic kind relations, or a type shifting rule for the original predicate modifier. There are many ways that strategy might be pursued in detail, and it is beyond the scope of this response to give a fully compositional analysis of generic comparisons. Since the current goal is only to show why even the most obvious extension of the sophisticated kind theory to transitive predicates is not committed to the truth conditions in (9), we may begin with the latter approach.

A type shifting rule of that kind could take the following form:

(10) $PM(f_{\langle e,\langle e,t\rangle\rangle})(p)(q) \rightsquigarrow PM(\lambda y\ .\ PM(\lambda x\ .\ f(y)(x))(p))(q)$[17]

That is, the type shifting rule would curry the dyadic relation into two monadic functions, apply the predicate modifier to each of those curried stages, and then apply the result to the dyadic relation's original two arguments.[18] Assuming such a rule, the truth conditions for a sentence like (6-b) would be as in (11-b), rather than (11-a):

(11) a. *size(F-kind)* $>$ *size(G-kind)*

b. $PM(\lambda y\ .\ PM(\lambda x\ .\ x > y))(\textit{cow-kind}))(\textit{horse-kind})$

Very roughly, the formula in (6-b) is true just in case horse-kind is characterized by the property of being shorter than the characteristic height of cows. And sentence (6-a) will be true just in case cow-kind is characterized by the property of being shorter than the characteristic height of horses. Here are the approximate forms of sentences (6-b) through (6-c), respectively:

(12) a. $PM(\lambda y\ .\ PM(\lambda x\ .\ x > y))(\textit{cow-kind}))(\textit{horse-kind})$

b. $PM(\lambda y\ .\ PM(\lambda x\ .\ x > y))(\textit{horse-kind}))(\textit{cow-kind})$

c. $PM(\lambda y\ .\ PM(\lambda x\ .\ x \sim y))(\textit{cow-kind}))(\textit{horse-kind})$

In order for (12-c) to be entailed by the falsity of (12-a) and (12-b), *PM* would have to have no scope effects with linear relations. We have said nothing about the semantics of *PM* as of yet,[19]

[17] This bit of notation, derived from the framework laid forth in Church (1940), is the standard means in natural language semantics for indicating different logical types. Read e as a logical type set aside for particular objects, t as a logical type set aside for truth values, and any expression $\langle \alpha, \beta \rangle$ in angle brackets as a logical type set aside for functions from entities of type α to entities of type β. To give some examples, a function of type $\langle e,t\rangle$ is a one-place predicate, a function of type $\langle e,\langle e,t\rangle\rangle$ is a two-place predicate, a function of type $\langle t,\langle t,t\rangle\rangle$ is a two-place boolean operator, a function of type $\langle\langle e,t\rangle,e\rangle$ is an expression like the definite article, and a function of type $\langle\langle e,t\rangle,\langle\langle e,t\rangle,t\rangle$ is a generalized quantifier. And for any condition ϕ, read $\lambda x_\alpha\ .\ \phi(x)$ as the function that maps any object of type α to the true just in case condition ϕ holds of it, and to the false otherwise.

[18] Currying (Schönfinkel, 1924) is the process of translating a dyadic relation into an equivalent sequence of functions, each of which takes one argument.

[19] That will come in section 5, where we will see that *PM* in fact does not have scope effects with linear relations.

but consensus in the literature holds that it must at a very minimum be intensional. And it would be quite typical for an intensional operator to have scope effects with linear relations. So a kind theory can accurately predict a failure of entailment in these cases, should that be required.

What this example shows is that the sophisticated kind theory is no less expressively flexible than a quantificational theory. The argument from generic comparatives provides compelling evidence that generic sentences have more logical structure to them than the simple kind theory posits. But that is only an argument against the simple kind theory—not an argument against kind-theoretic approaches as such. Such arguments can simply be added to the growing body of evidence against the simple kind theory.

In fact, most criticisms of the kind theory are really just criticisms of the simple kind theory. We now turn to three illustrative examples.

3.1.1 Scope Ambiguity

The presence of scope ambiguity in generics containing an indefinite noun phrase in object position is standardly assumed to pose a problem for the kind theory.[20] If generic sentences are nothing more than monadic predications, the indefinite noun phrase should have nothing to interact with scopally. The usual examples are along the following lines:

(13) Swans have a favorite nesting spot.[21]

There are two readings of this sentence. On one, there is a single nesting area that swans prefer. On the other, swans tend to have a preferred nesting area, but different swans prefer different nesting areas. Now, if generic sentences were to contain an unpronounced quantifier at logical form, this scope ambiguity could be explained in the usual way.[22] An analysis according to which they are simple monadic predications lacks the resources to predict this ambiguity.

20 See Cohen (2001), pg. 193.

21 This example originates from Schubert & Pelletier (1987), pg. 407. Interestingly, they don't seem to think it poses a problem for the kind theory.

22 That is, either by type-raising (Hendriks, 1988) or quantifier raising (May, 1977).

But of course, that only applies to the simple kind theory. As with the comparative case, the simple kind theory need only assume that *PM* is the sort of operator that exhibits scope effects with indefinites. And once again, even though we have said nothing about the semantics for the predicate modifier here beyond supposing that it is intensional, being able to exhibit scope ambiguities with indefinite noun phrases is hardly unfamiliar behavior for an intensional operator. Since *PM* is a logical operator like any other, a sophisticated kind theory can easily account for the ambiguity in sentence (13) using a standard theory of quantifier scope ambiguity, such as flexible types. The flexible types approach to quantifiers is a method for dealing with two problems in one fell swoop: a) that natural language quantifiers give rise to scope ambiguity, and b) that they are uninterpretable in object position.[23] Consider the following example:

(14) Every magician owns a rabbit.

Analogously to the generic example, sentence (14) has two available interpretations: one in which the existential quantifier phrase *a rabbit* scopes over the universal quantifier phrase *every magician*, and another in which the universal takes wide scope. *A rabbit* is uninterpretable in object position because dyadic predicates such as *own* are meant to take objects as arguments, not second-level functions. To deal with both of these problems, the flexible types approach allows quantifiers to shift their denotation in one of the following two ways when in object position:

(15) a. **Ordinary quantifier phrase**: $\langle\langle e,t\rangle,t\rangle$

$[\![\textbf{a rabbit}]\!]^{M,g} = \lambda f_{\langle e,t\rangle} \,.\, \exists x(rabbit(x) \wedge f(x))$[24]

b. **Wide scope quantifier phrase**: $\langle\langle e,t\rangle,t\rangle \rightsquigarrow \langle\langle e,\langle e,t\rangle\rangle,\langle\langle\langle e,t\rangle,t\rangle,t\rangle\rangle$

$[\![\textbf{a rabbit}]\!]^{M,g} \rightsquigarrow \lambda f_{\langle e,\langle e,t\rangle\rangle} \,.\, \lambda Q_{\langle\langle e,t\rangle,t\rangle} \,.\, \exists x(rabbit(x) \wedge Q(f(x)))$

c. **Narrow scope quantifier phrase**: $\langle\langle e,t\rangle,t\rangle \rightsquigarrow \langle\langle e,\langle e,t\rangle\rangle,\langle\langle\langle e,t\rangle,t\rangle,t\rangle\rangle$

23 This approach derives from Hendriks (1988).

24 In natural language semantics, it is customary to use the circumfix symbol $[\![\cdot]\!]$ for the object language interpretation function that maps expressions of English to denotations in the logical metalanguage. Following Roelofsen (2008), we will also use $\|\cdot\|$ for the metalanguage interpretation function that maps expressions in the logical metalanguage to their truth/reference definitions. Both of these interpretation functions operate relative to a model and a variable assignment function.

$$[\![\textbf{a rabbit}]\!]^{M,g} \rightsquigarrow \lambda f_{\langle e,\langle e,t\rangle\rangle} \,.\, \lambda Q_{\langle\langle e,t\rangle,t\rangle} \,.\, Q(\lambda x \,.\, \exists y(rabbit(y) \wedge f(x,y)))$$

The expressive power of the lambda calculus makes it possible to systematically vary the definition of a single expression like *every* or *a* so that it can 'pass arguments' up the syntactic tree if need be. But if the lambda calculus is able to deal with scope ambiguity between quantifiers, negation, attitude verbs, and modals, why not employ the very same strategy to deal with scope ambiguity between quantifiers and the predicate modifier? To simplify exposition, we may assume an atomic type for kinds, which we will represent using the letter k, and that *PM* is a function from object predicates to kind predicates, i.e. a function of type $\langle\langle e,t\rangle,\langle k,t\rangle\rangle$. The denotation of *a favorite nesting spot* in sentence (13) could then shift in either of the following two ways:

(16) a. **Wide scope quantifier phrase**: $\langle\langle e,t\rangle,t\rangle \rightsquigarrow \langle\langle e,\langle e,t\rangle\rangle,\langle e,t\rangle\rangle$

$[\![\textbf{a f.n.s.}]\!]^{M,g} \rightsquigarrow \lambda f_{\langle e,\langle e,t\rangle\rangle} \,.\, \lambda x \,.\, \exists y(nestSpot(y) \wedge f(x,y))$

b. **Narrow scope quantifier phrase**: $\langle\langle e,t\rangle,t\rangle \rightsquigarrow \langle\langle e,\langle e,t\rangle\rangle,\langle\langle\langle e,t\rangle,\langle k,t\rangle\rangle,\langle k,t\rangle\rangle\rangle$

$[\![\textbf{a f.n.s.}]\!]^{M,g} \rightsquigarrow \lambda f_{\langle e,\langle e,t\rangle\rangle} \,.\, \lambda h_{\langle\langle e,t\rangle,\langle k,t\rangle\rangle} \,.\, \lambda K_k \,.\, h(\lambda x \,.\, \exists y(nestSpot(y) \wedge f(x,y)))(K)$

Further details depend on how exactly we decide to define *PM*, and there are many options there as well. But this should suffice to illustrate how a sophisticated kind theory can predict the presence of scope ambiguity in sentences like (13).

3.1.2 Context-Sensitivity

Sterken (2015, forthcoming) argues that a kind-theoretic analysis of generics offers no obvious source for their context-sensitivity. That would seem to be at odds with one of the principal claims of this paper, which is is that a kind-theoretic approach is optimally suited to capturing the particular brand of context-sensitivity we see in generic sentences.

Thankfully, Sterken's view is not in fact at odds with the principal claim of this paper. The reason is that Sterken only considers the simple kind theory, rather than the sophisticated kind theory under discussion here. Indeed, it is at first difficult to see what source for context-sensitivity there could be in a simple kind theory:

(17) Fs are G : *true iff G(f)*

(where f is an individual constant denoting F-kind)

Nonetheless, it should be noted that with the following addition, even the simple kind theory can accommodate a certain amount of context sensitivity:

(18) Fs are G : *true iff* $G(\iota k\colon \forall y(F(y) \leftrightarrow y \in k))$

That is, rather than taking the bare plural *Fs* to be the *proper name* of a kind, why not take it to be a *definite description* referring to a kind? A kind theory will likely have to go this route anyway, for compositionality reasons.[25] In the above formulation, the bare plural *Fs* would refer to that kind of which everything in the extension of the predicate F is a member. Depending on how exactly the iota operator is defined, it may very well have some context sensitivity—for instance, it could have a similar semantics to the definite article, according to which it picks out the unique contextually salient object that fits the description in its scope.

When it comes time to present the analysis in section 5, we will first give a static analysis that contains an operator similar to the iota operator in (17), then show how to incorporate discourse-level sensitivity into it, so that it can pick up on kinds that are salient in a conversation. There are many reasons one might want to introduce a familiarity presupposition into the analysis, but the relevant reason in this case is that it is gives us a way of restricting which groups of objects are all members of the same kind and which are not—or more specifically, which predicates have extensions whose members all belong to the same kind and which do not. Section 4.2 will present some linguistic data to motivate such a distinction.

One further possible source for context sensitivity, in this case specific to the sophisticated kind theory, lies in the predicate modifying operation. If *PM* is intensional, then it could turn out to be a modal of some kind, and it is a well-known feature of modal operators that they are

[25] E.g. If you understand the sentence ‘Squirrels are black’ and the words *from* and *Poland*, then you should have everything you need to understand the sentence ‘Squirrels from Poland are black.’

context-dependent.[26] This means that right out of the gate, the kind theory provides two potential semantic sources for context sensitivity in generics.

3.1.3 Free Choice Effects

Another objection to the kind theory has to do with its predictions vis-à-vis free choice effects. The data have yet to be fully investigated, insofar as it is less clear that 'Elephants live in Africa or Asia' implicates 'Elephants live in Africa' than it is that 'You may have an apple or a pear' implicates 'You may have an apple.' Nonetheless, generic disjunctions do give rise to the following bizarre implication,[27] which closely resembles a free choice effect:

(19) Elephants live in Africa or Asia. $\leftrightsquigarrow$ Elephants live in Africa and they live in Asia.
Fs are G or H. $\leftrightsquigarrow$ Fs are G and Fs are H.

Nickel (2010b) raises the worry that the kind theory lacks the logical resources to explain this implication, because it understands generic sentences as simple monadic predications. Now, free choice is a complicated phenomenon, and a host of formal theories that attempt to explain it are presently on offer.[28] This is not the place to put forth an analysis of generic free choice. For our purposes it suffices to note, once again, that this phenomenon only raises a problem for the *simple* kind theory. The sophisticated kind theory allows for a disjunction to be in the scope of the predicate modifier, should that eventually be settled upon as the best option. Since the predicate modifier is intensional, it should come as no surprise that it gives rise to free choice effects—disjunctions are known to have free-choice readings, for instance, when they are in the scope of a modal.[29]

26 For example, their meaning is computed with respect to a contextually supplied modal base and ordering source (Kratzer, 1981), and they seem to be able to undergo modal subordination (Roberts, 1989).

27 Note that only one of two possible interpretations of sentence (19) gives rise to this interpretation—the 'Africa or Asia, but I don't know which' interpretation does not.

28 Including but not limited to Asher & Bonevac (2005); Alonso-Ovalle (2006); Fox (2007); Barker (2010).

29 Section 5 will lay out a definition for *PM* that involves an existential quantifier. That it is typically modals with existential force which give rise to free choice effects suggests that this definition might at least provide a promising start to tackling the problem.

Hopefully, these three examples are beginning to illustrate a pattern in the literature on generics: what are standardly put forth as arguments for a quantificational theory of generics over a kind theory really are, upon further inspection, arguments for an analysis with a bit more logical structure than the simple kind theory. But there, either a quantificational theory or a sophisticated kind theory will fit the bill.

4 Four Contrasts

Having established that the sophisticated kind theory and the adverbial quantificational theory are on equal footing as regards the standard objections, the next task is to show what the sophisticated kind theory can bring to the table. In the coming section, we will examine four distinctive semantic characteristics of generic statements. These can all be thought of as contrasts with statements that contain a determiner quantifier (hereafter, *quantified statements*), which in the author's view puts the determiner quantifier analysis of generics (Asher & Morreau, 1995; Asher & Pelletier, 1997) on considerably shakier ground than the adverbial quantificational theory. But the important point about these four features is that they are not only rather unusual from a logical point of view—they are specific to generic statements of the sort that interest us here. The final section will show how a sophisticated kind theory can neatly explain why generic statements have these four remarkable semantic features.

The four distinctive features are as follows. First, generic sentences do not contextually domain restrict. Second, generic sentences are more selective than quantified sentences about what kind of predicate they will admit in subject position. Determiner quantifiers will accept more or less any well-defined predicate, but generic sentences seem to require something more. Third, generic sentences vary as to whether they are interpreted artifactually or non-artifactually, which is a form of context sensitivity not encountered elsewhere. Fourth and finally, the kind of generic this discussion has focused on so far, often called the I-generic, can occur co-predicated with another variety of statement called the D-generic. As will be discussed, D-generic statements have a similar surface grammar to I-generic statements, but a very different meaning.

4.1 No Domain Restriction

It is a well-known fact that natural language quantifiers like *every*, *no*, *some*, *all*, and *most* pick up important additional information about their restrictor predicate from conversational context.[30] To illustrate, suppose I walk into the class I am teaching and say:

(20) Is every student here?

In that context, I am not asking whether every student in the entire universe is there; I want to know whether everyone enrolled in the course is present. But I never said, 'who is enrolled in the course.' That part was left implicit. Philosophers and semanticists call this phenomenon *quantifier domain restriction*, because of the intuition that in sentences like (20), rather than generalizing over the extension of the restrictor predicate—*student*, in this case—we generalize over a subset of that extension. Thus, the domain of quantification—the set of all students—is *restricted* to one of its subsets—the set of all students in the class. Quantifiers are rarely, if ever, used unrestrictedly.

A natural question to ask when considering whether generic sentences contain a quantifier, then, is whether they also contextually domain restrict. Strikingly, they do not. To get a feel for the contrast, consider the following situation. Imagine you are a reporter for an animal rights magazine, and you hear that Wayne Newton annexed a new ranch specifically for jaguars onto his property. Your magazine flies you over to the ranch to investigate. After several days of touring the ranch, you discover that Mr. Newton's jaguars have been given identificatory tattoos on the insides of their ears. From your point of view, of course, this is needlessly painful and thus morally abhorrent. Your editor travels to the ranch in order to witness what is happening first-hand, and you pick her up at the airport, driving straight to the ranch and eventually arriving at a location where all the jaguars have congregated, their tattoos clearly visible. Then, while opening the door

[30] For some classic discussion of contextual domain restriction, see Stalnaker (1970), pg. 276 and Lewis (1979), Example 3. More modern treatments can be found in von Fintel (1994) and Stanley & Szabó (2000).

to the back of your car, you proclaim:

(21) (*opening the door*)

Unbelievable. Every jaguar has a tattoo.

This discourse is perfectly felicitous (and true). Why? Because although it is false that every jaguar in the world has a tattoo, it is true that every contextually salient jaguar—every jaguar on the ranch—has a tattoo. But now compare the following alternative discourse, with the corresponding generic in place of the quantified sentence.

(22) (*opening the door*)

Unbelievable. ??Jaguars have tattoos.[31]

In this context, the corresponding generic is at least false, and probably also infelicitous. Why? No interpretation on which it concerns only jaguars on the ranch is available. Saying that jaguars have tattoos in this context sounds like a non-sequitur, because its only possible interpretation is one on which it concerns jaguars in general.

Or imagine you are Willem de Vlamingh's first mate, stumbling across the Swan River in Australia for the first time in 1697. In that context, a generic statement about 'swans' would not be appropriate for expressing your astonishment at a flock of black swans. But a quantified statement would:

(23) a. I can't believe my eyes! Every swan is black.

b. I can't believe my eyes! ??Swans are black.

These examples illustrate an important distinction between generic sentences and quantified sentences.[32] Determiner quantifiers, in their standard usage, generalize over a subset of the predicate explicitly uttered. Generics, by contrast, are interpreted in the broadest sense possible. A quanti-

[31] I will adopt the convention of using the symbol # to mark a sentence off as a contradictory, infelicitous, or otherwise semantically ill-formed. The symbols ? and ?? indicate lesser degrees of semantic anomaly.

[32] For a related example, see Asher & Pelletier (1997), pp. 1165-66.

fied statement is almost always going to be about some particular jaguars who are relevant to our discussion. A generic, on the other hand, resists that kind of interpretation–it is used to characterize jaguars as such.

Nonetheless, we might wonder whether there is anything special about the cases just discussed. Perhaps there are other special circumstances in which generic sentences do contextually domain restrict. It would not be unreasonable to think, on first glance, that examples in the vein of Condoravdi (1992, 1997) are indeed cases in which generic sentences contextually domain restrict.[33] But upon further inspection, it seems that whatever is afoot in these cases cannot be genuine contextual domain restriction. Whatever phenomenon they may be examples of, it is more limited in scope.

Perhaps it is time for a closer look at one of these potential counterexamples. In most contexts, the following sentence is false:

(25) Squirrels are friendly to people.

But mentioning a location at which squirrels behave unusually allows the speaker to give the above sentence a narrower interpretation:

(26) Washington Square Park is quite a place. Squirrels are friendly to people.

Why is it true to say that squirrels are friendly to people in this new context? Presumably it has to do with the fact that these are subject to an unusual amount of tourist traffic, which has led them to evolve a distinctive set of behavioral habits over time. Marking the park off as something noteworthy has made available a reading on which it is squirrels in the park, rather than squirrels in general, that are under discussion.

---

33 Condoravdi's original example was the following:

(24) A ghost has been haunting campus. Students are afraid.

That particular example will not do as a counterexample, because *afraid* is a stage-level predicate, and so it is difficult to hear the second sentence of (24) as a generic. But closely-related examples such as the one I present suggest themselves.

One fact to bear in mind is that judgments about these examples are not as unshakably robust as one might hope. Although the majority of native speakers informally consulted for this paper find them well-formed, a minority find them ill-formed, strongly preferring variations that begin with 'squirrels there' or 'in Washington Square Park, squirrels...' So it would be ideal not to lean on them too heavily as counterexamples to the claim that generic sentences do not domain restrict.

But suppose, for the sake of argument, that judgments in (26) are completely robustly attested across a wide range of English speakers. Even then, it seems unlikely that these examples involve anything like *domain restriction*. One reason is that as we observed, a key feature of quantifier domain restriction is that it happens by default. The above phenomenon, whatever it may be, only happens in particular circumstances. Essentially, it only happens when the speaker marks a location off as remarkable earlier on in the discourse.

A natural thought for the quantificational theorist to have at this point would be that it is a bit too simple to say that quantifiers domain restrict by default.[34] There is evidence to suggest that some quantifiers can domain restrict only anaphorically, and others can domain restrict both anaphorically and deictically. So perhaps the generic quantifier is incapable of domain restricting *deictically*; it can only domain restrict *anaphorically*. The examples involving jaguars and swans were all deictic, in the sense that the information about how the predicate explicitly mentioned is to be restricted comes from information perceptually available to the speaker and listener. So example (26) might be thought of as a case of anaphoric domain restriction, in the sense that the information about what to restrict the predicate *squirrel* to—Washington Square Park squirrels—comes from a location mentioned earlier in the discourse—Washington Square Park. On such a view, there is a generic quantifier, but the reason it fails to contextually domain restrict in the original examples is that there is nothing earlier in the discourse on which the contextual restriction can base itself.

The problem with taking this route is that if there were a generic quantifier that was anaphoric-

[34] To the author's knowledge, there are no cases in which this has been observed in determiner or adverbial quantifiers, but there is some evidence of a deictic/anaphoric-deictic only contrast in modal auxiliary verbs. For instance, Klecha (2011) argues that *gonna* can domain restrict either deictically or anaphorically, whereas *will* can only domain restrict anaphorically.

only (as it were), then the mere mention of a location in advance would suffice to license the Condoravdi phenomenon. But it does not:

(27) a. Yesterday I spent the day photographing animals in Washington Square Park. #Squirrels are friendly to people.

b. Yesterday I spent the day photographing animals in Washington Square Park. Every squirrel is friendly to people.

Further variations prove comparably awkward, and the quantifier is always a more natural fit:

(28) a. Have you been to Never Never Land? ??People/Everyone can fly.

b. In Washington Square Park, squirrels are given euphoria-inducing drugs. ??Squirrels are/Every squirrel is friendly to people.

c. In Washington Square Park, tourists have been feeding animals for years. ?Squirrels are/Every squirrel is friendly to people.

Thus, it seems there is independent reason to think that something other than domain restriction is happening in the Condoravdi cases. If they truly were instances of contextual domain restriction, they would have to occur in a much wider range of environments.

4.2 The Cohesiveness Presupposition

The second distinguishing feature of generic sentences is that they will not accept just any predicate in subject position. They are most naturally made about groups of things that intuitively all belong to the same kind—whose behavior is easily thought of, in context, as governed by a unified set of (defeasible) principles. Since interlocutors' explanatory purposes vary from conversation to conversation, the same group of things may be easier or more difficult to think of as governed by similar behavior, depending on the conversational context. But this contextual variation notwithstanding, we can still observe that in any context where a generic sentence rules some predicate out, the corresponding quantified sentence will accept that predicate.

In general, the more heavily modified a predicate is, the more specific the context required to make it intelligible as having an extension whose members have something meaningful in common. And accordingly, the more heavily modified a predicate is, the more specific the context required to felicitously utter a generic using it in subject position. This is not to say that generic sentences are resistant to *all* heavily modified predicates. The following, for instance, all sound just fine:

(29) a. Rabbits are skittish.

b. Rabbits from Mexico are skittish.

c. Rabbits with fluffy fur are skittish.

These sentences are all equally felicitous. However, Carlson (1982) has observed that in many generic sentences whose subject position noun phrase is modified by an indexical expression, the generic becomes awkward:[35]

(30) a. #Toppings on this pizza are vegetarian.

b. #Chairs in that house are made of oak.

c. #Desks that I am looking at right now have metal tops.

Quantified sentences are comparatively indifferent to what sort of predicate appears in their restrictor position:

(31) a. Every/some/most topping(s) on this pizza is/are vegetarian.

b. Every/some/most chair(s) in that house is/are made of oak.

c. Every/some/most desk(s) that I am looking at right now has/have a metal top.

The sentences in (30) are at least false and probably also infelicitous, even in situations which make the sentences in (31) true. A generic sentence can, in certain circumstances, admit an indexically-modified noun phrase in subject position. But whenever it does not, the corresponding quantified sentence does.

[35] See Carlson (1982), pg. 153.

Why might that be? Ultimately, this distinction should not be surprising. Many authors have had the intuition that generic sentences have a lawlike character to them—that they describe defeasible principles which hold of certain kinds of things (Milsark, 1974; Dahl, 1975; Carlson, 1977a; Asher & Pelletier, 1997; Cohen, 2001). But in order to make a statement with a lawlike character to it, one must first be talking about a class of objects to which some set of laws applies. An arbitrary group of objects is not the sort of thing we think of as governed by substantive, non-trivial laws. If generic statements have this lawlike character, they are ideally made about groups of things that are all governed by a unified set of laws. So in a way, it makes perfect sense that an indexical predicate—under whose extension an object falls only due to coincidental factors like when and where it is uttered—would sound odd in subject position of a generic.[36] Why should we think that there are any special principles governing the behavior of the toppings on a specific pizza?

Generic sentences, it would seem, cannot be made about merely any set of objects. The set of objects have to have something further in common. To mark this (somewhat sketchy) distinction, call predicates whose extensions have this feature, whatever it is, *cohesive*, and any predicates that are not cohesive *haphazard*. We will say generic sentences come with a presupposition that the predicate in subject position is cohesive. Taking the above three indexically-tinged predicates as paradigm cases of haphazard predicates, we may observe that the class of predicates admissible in subject position of a generic lines up rather closely with what philosophers have called *sortal predicates*.

The sortal/non-sortal distinction comes out of Strawson (1959), Geach (1980), and Wiggins (2002), who trace it back to Gottlob Frege, Thomas Aquinas, and Aristotle.[37] It very roughly lines up with the distinction between nominal predicates, on the one hand, and verbal and adjectival predicates, on the other. The philosophical intuitions behind sortal predicates have to do with what is required to be competent at deploying them (Geach, 1961). In order to be competent in the use

[36] In principle, indexical predicates shouldn't be the only kind that sound awkward in subject position of a generic sentence. But the way they pin their extensions to the particular circumstances in which they are uttered makes them especially useful as illustrative examples.

[37] For a good contemporary overview, see Lowe (2009).

of a non-sortal predicate F, one needs to know how to determine what falls under F's extension. But in order to be competent in the use of a sortal predicate K, one (at least) also needs to be able to:

(32) a. Determine, for any two objects, whether they are *the same K*.
b. Count *K*s.[38]

The second set of intuitions behind sortal predicates is linguistic. The aforementioned authors (including Aristotle) also provocatively suggest that this set of philosophical intuitions manifests itself as a set of grammatical tests:

(33) Ashley: What is that on the horizon? *Metaphysics* 7.1, Wiggins (2002)
Whitney: It's a whale.

(34) Ashley: What is that on the horizon?
Whitney: ??It's a green thing.

(35) a. This and the animal you saw last night are in fact the same whale.
b. ??This and the tennis ball you saw yesterday are in fact the same green thing.
Geach (1980), Gupta (1980)

These data are subtle, and should be heard as contrasts. Nonetheless, it is clear that for appearing in *the same K as* constructions and *What is it?* questions, sortal predicates are the optimal choice.

What does it take for a predicate to be cohesive—to qualify as the subject of a generic sentence? That is a big question. But at this point, it can *at least* be said that the class of cohesive predicates, the category selected for by the indexical-generic diagnostic given earlier, lines up closely with the class of sortal predicates, the category selected for by the above three diagnostics. Cohesive predicates must at least be sortals.

To see this, we may run some of our indexical predicates through some of the tests for sortals.

[38] Certain accounts of sortal predicates collapse these two conditions, but we may follow Geach (1980) in assuming that competence in (32-a) is a necessary but not sufficient condition for competence in (32-b).

For the first example, imagine that two people are looking at a blow-up of a photograph taken from a bird's eye view at a great height, with a barely discernible pizza off in the corner.[39]

(37) Ashley: (Pointing to a speck in the photograph.) What is that speck?

Whitney: It's a pizza topping/??topping on this pizza.

For the second example, imagine that two people are standing in front of a window that faces a house. They are looking at a live video feed from a camera placed inside the house, but the image is out of focus.

(38) Ashley: What is that blurry blob?

Whitney: It's a chair/??chair in that house.

For the final example, imagine that two people are walking home after having helped a friend move a new piece of furniture into their new house. One asks the other:

(39) a. Can you believe that the piece of furniture we just assembled and the heavy object in that box are actually the same chair?

b. #Can you believe that the piece of furniture we just assembled and the heavy object in that box are actually the same chair in that house?

Given the way those examples go, we might expect non-sortal predicates to be more awkward in subject position of a generic sentence than they are in restrictor position of a quantified sentence.

[39] A few further conditions must be met in order for this test to tell us anything. Most importantly, 'What is that?' must be uttered with what one might argue to be its most basic, literal meaning, in which the person asking the question lacks any means of substantively identifying the object. Sometimes, we also ask 'What is that?' in contexts where we have already identified the object, but we want to know further facts about it that would explain its significance. In those contexts, the question means something more like: 'Why are you treating this object in that way?' And there it can make perfect sense to use an indexically modified predicate. For example:

(36) (Ashley is looking longingly at a comb.)
Whitney: What is that thing?
Ashley: It's a comb that used to belong to my mother.

In this case, the very context that a nonstandard construal of 'What is that?' available is the context that makes *comb that belonged to my mother* into a sortal predicate. In a moment, we will look at similar examples of context sensitivity sortals.

And that is just what we find:

(40) a. Plants are inanimate.

b. ??Green things are inanimate.

c. Most green things are inanimate.

In ordinary contexts, adjectival predicates make for odd generic sentences. One reason for this is that to form a generic sentence with an adjectival predicate in subject position, one must fit it into the mold of a noun phrase by combining it with a vacuous nominal predicate like *thing*, *object*, or *stuff*, which makes such generic sentences sound stilted. But more to the point, in most contexts there is something woefully underspecified about the predicate *green thing*. Green *what*, one wants to ask.[40] Defenders of the notion of sortals have sought to capture this underspecification by saying that green things have no *identity criteria*: no principle in virtue of which any particular green thing is the same as or different from any other.

It is important to recognize that this not the case in all contexts. Given the appropriate situation, a predicate like *green thing* can take on the kind of explanatory significance necessary for it to perform in a generic sentence. Suppose, for example, that two people are in the path of a charging bull. In that situation, one might say to the other:

(41) Quick! Hand me something red! Anything red! Red things are useful for fending off charging bulls.

The same goes for the earlier cases. In a situation where the pizza before the speaker is of special significance, a generic sentence about toppings on it sounds remarkably improved. Suppose the world's greatest pizza chef has prepared some dough with a little oil, cheese, oregano, and tomato sauce, and has left it up to the addressee to decide how to top it. In that situation, it would be reasonable for an onlooker to utter:

40 Surely that must be what Aquinas had in mind when he wrote that nominal (or substantival) predicates 'carry their subject with them,' whereas adjectival predicates 'add the thing signified to the substantive.' See Aquinas I: Q. 39, Art. 5.

(42) Toppings on this pizza are strictly optional. It'll be great no matter what.

Whether a predicate is cohesive, then, is context-dependent; it varies with the explanatory purposes of the conversational participants. This is a nontrivial wrinkle in the data regarding cohesion.

If the cohesion of a predicate is context-dependent in this way, and the diagnostics for cohesive predicates agree in output with the diagnostics for sortal predicates, then this observation brings with it a fairly significant consequence: namely, that the sortal/non-sortal distinction is context dependent in just the same way. And indeed, one could make the case that this prediction is borne out. Imagine that Evelyn and Vivian are observing someone at whom a bull is charging, and Evelyn is color-blind. We might then imagine either of the following two conversations taking place:

(43) Evelyn: What is he pulling out of his pocket?

Vivian: It's a red thing. He's going to distract the bull and make a break for it!

(44) Evelyn: He's using the same red thing he used last week to distract another bull.

If this is right, then the distinction between sortal and non-sortal predicates is just as context-relative as the distinction between cohesive and haphazard predicates. It is not quite as clear-cut as saying that such-and-such are the sortals, and so-and-so are the non-sortals, *point finale*. Rather, convincingly demonstrating a given predicate to be sortal or non-sortal in a given hypothetical context will require us to make sure we do not accidentally underspecify that context.

Though they have had a presence in the philosophical literature for some time, the tests discussed in this section have not been thoroughly explored by natural language semanticists, and clearly there is more work to be done before we can be confident of their viability as true grammatical diagnostics. The only observation required for present purposes is that when, in a particular context, a given generic is resistant to a predicate in subject position, the corresponding quantified sentence exhibits no such resistance. Let that be a second point in favor of a kind theory.

4.3 Artifactual Interpretations

The third contrast involves a kind of context-sensitivity that is present only in generic sentences. Unlike quantified sentences, generic sentences are often susceptible to both artifactual and non-artifactual interpretations. This is brought out by cases where the same kind is ascribed different properties depending on whether it is being regarded *qua* artifactual kind or *qua* non-artifactual kind (Nickel, 2008):

(45) a. Dobermans have floppy ears. *true when uttered by biologists*

b. Dobermans have pointy ears. *true when uttered by dog breeders*

Presumably, the first sentence would be true in e.g. a context where evolutionary biologists were comparing Doberman Pinschers with German Shepherds, whose ears naturally grow to be pointy. Dobermans are born with floppy ears that are traditionally cropped to come out pointy. So the first sentence, when true, would capture that fact about their phenotypic characteristics. It would be true on the non-artifactual interpretation. The second sentence would be true in a context where the conversational participants were comparing the features of different breeds in view of their cultural role. This is the more familiar context, given that it is relatively uncommon to see a Doberman with natural ears. The second sentence, when true, would be used to capture the fact that in order to fulfill the cultural roles we have prescribed for them (being recognizable as dobermans, being threatening, having an enhanced ability to hear intruders), Doberman Pinschers are typically given pointy ears. So here we would have the artifactual interpretation, in the sense that the property is being applied to dobermans *qua* cultural artifact.

These readings are not easy to achieve with quantifiers. The corresponding quantified sentences give rise to neither the artifactual nor the biological interpretation; they can be understood neither as describing the ontogenetic tendencies of dobermans nor as describing the cultural practice of raising dobermans. Rather, they simply generalize over actual dobermans.[41]

[41] This is leaving to one side contexts in which the salient domain restriction is to e.g. dobermans in a particular room, all of whom have natural ears. The point is that the assignment of truth values in (46) arises in contexts where the corresponding generic would go the other way.

(46) a. Few dobermans have pointy ears. *false*

b. Few dobermans have floppy ears. *true*

c. Most dobermans have pointy ears. *true*

d. Most dobermans have floppy ears. *false*

e. Every doberman has pointy ears. *false*

f. Every doberman has floppy ears. *false*

As we saw, generic sentences like (45-a) and (45-b) require only a small amount of contextual nudging to flip from being construed artifactually to being construed non-artifactually (and vice versa). The sentences in (46), on the other hand, do not have multiple interpretations; sentences (46-d) and (46-f) cannot be uttered in a conversation among evolutionary biologists to convey the thought that dobermans are born with floppy ears. One could perhaps force such an interpretation by adding an illocutionary modifier like *really*:

(47) Really, every doberman has floppy ears.

But that only highlights the contrast with the generic, which can naturally receive an artifactual interpretation without the use of such illocutionary operators.

4.4 D/I Co-predications

This paper is concerned mainly with bare plural generic sentences which have a characterizing reading. These are sometimes called *I-generics* and contrasted with *D-generics* (Krifka, 1988). And yet, one key feature even of I-generics has to do with how they and D-generics can interact. A D-generic is a statement that grammatically resembles the kinds of statements we have been looking at, but in which the predicate is not applicable to individual objects. We can see from the following examples of D-generics that they have completely different truth conditions:

(48) a. Toasters were invented in the 1920s.

b. Ichthyosaurs are extinct.

c. *Star Wars* fans are numerous.

None of the sentences in (48) can plausibly be said to involve a loose generalization over individual objects, because none of the sentences in (48) can plausibly be said to involve individual objects at all. It is a flat out category error to think that a *Star Wars* fan could be (or fail to be) numerous, or that a single ichthyosaur could be extinct. It is not a category error to think that an individual toaster could have been invented, per se, but sentence (48-a) is nonetheless clearly not trying to suggest that individual toasters tend to have the property of having been invented in the 1920s.

The received wisdom about D-generics, even among semanticists who favor an adverbial quantificational semantics for I-generics (Krifka *et al.* , 1995), is that the bare plural noun phrase refers directly to a kind, and that the predicate ascribes a kind-level property to that kind. Although a full analysis of D-generics is far beyond the scope of this paper, it is worth noting that the sophisticated kind theory, when combined with the received wisdom about D-generics, offers a neat explanation for why I-generics have the ability to co-predicate with D-generics:

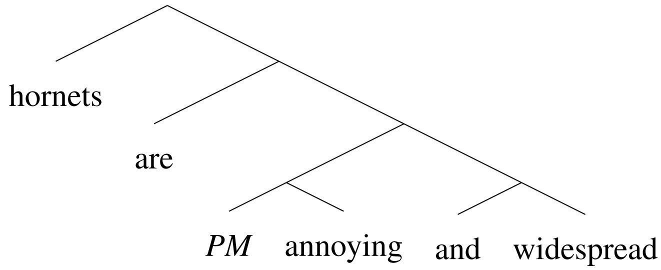
(49) Hornets are annoying and widespread.

Sentence (49) would seem to be some sort of combination of (50-a), which is an I-generic statement about a property that individual hornets tend to have, and (50-b), which is a D-generic statement about how far hornet-kind extends geographically:

(50) a. Hornets are annoying.

b. Hornets are widespread.

Semantic analyses that assign radically different logical forms to (50-a) and (50-b) are put under pressure by the well-formedness of sentences like (49). However, the sophisticated kind theory, in combination with what is typically assumed about the logical form of D-generics, assigns these co-predications the following LF:



Assuming that *and* is a polymorphic operator (Leiß, 1991; Shieber, 1992) of type $\langle \alpha, \langle \alpha, \alpha \rangle \rangle$,[42] it requires each of its arguments to be identical in semantic type. If the predicate *widespread* is of type $\langle k, t \rangle$, as the standard view of D-generics has it, then the constituent [*PM* annoying] must also denote a function of type $\langle k, t \rangle$. Since, as discussed in section 3.1.1, *PM* is a function of type $\langle \langle e, t \rangle, \langle k, t \rangle \rangle$ and *annoying* is a predicate of type $\langle e, t \rangle$, the constituent [*PM* annoying] does indeed denote a function of type $\langle k, t \rangle$, as expected. Therefore, the D/I co-predication is well-typed.

So a fourth distinguishing feature of I-generics is that they can occur in these constructions, and that when they do, they are synonymous with the conjunction of the corresponding D-generic and I-generic—that is, (49) is synonymous with the conjunction of (50-a) and (50-b). A particular strength of the sophisticated kind theory is that it makes both of these predictions.

5 A Kind-Theoretic Analysis

We now turn to a brief presentation of how a kind-theoretic analysis can account for the above four phenomena. We saw in section 3.1.1 that the semantic type of *PM* should be $\langle \langle e, t \rangle, \langle k, t \rangle \rangle$. But which function will it denote? To answer that question, it will be necessary to take a step back and think about what sort of entity the atomic type k is intended to model.

A helpful way into the atomic type k, for the purposes of the analysis, is to think of it as the semantic type for what we may call *production processes*.[43] Think of a production process

[42] This is just a way of saying that *and* is a function mapping any pair of entities or functions of the same type to a third entity or function of that type. So functions of type $\langle t, \langle t, t \rangle \rangle$ or $\langle \langle e, t \rangle, \langle \langle \langle e, t \rangle, \langle e, t \rangle \rangle \rangle$ are of type $\langle \alpha, \langle \alpha, \alpha \rangle \rangle$ but e.g. functions of type $\langle e, \langle e, t \rangle \rangle$, $\langle \langle e, t \rangle, \langle \langle e, t \rangle, t \rangle \rangle$, or $\langle \langle e, t \rangle, e \rangle$ are not.

[43] For the full explanation of this metaphysical picture, see Teichman (2015), chap. 3. The full semantic analysis is spread out between chapters 3 and 4.

as the activity of making things. If a kind is to be identified with the activity of making things, then being a member of a kind will simply be a matter of having been created by that activity. For example, at the Ferrari plant in Maranello, Italy, cars are currently being manufactured. So the activity of manufacturing cars is currently taking place there, and the Ferraris are the things that were manufactured in the course of that activity. There are many different kinds of properties that production processes can have, but one relevant kind of property this process can have is that it creates things with a horse crest. That is not to suggest that everything it makes has a horse crest—there could be unforeseeable accidents in the car-making process that lead certain cars to come out crestless. Perhaps a small number of concept cars produced at the factory lack those small finishing touches. Nonetheless, whatever explanations may underlie these nonstandard examples, their existence is still compatible with its being the case that the process of manufacturing Ferraris in Maranello is a process which makes things with a horse crest. The nonstandard examples arise when the process is interfered with in some way.

The thought is that to every property which applies to individual entities, there corresponds a property of being a process that makes individual entities with that entity-level property.[44] And so, *PM* will be a map from the former kind of property to the latter. The fact that it is possible to be a process which makes things that are G while still making certain things that are not G indicates that the property of being a process which makes things that are G will have to be intensional. That is, determining whether a process has this kind of property will involve looking not just at the actual world, but at other possible worlds. In order to model this insensitivity to accidental interference, we include a theoretically primitive modal base function of type $\langle s, \langle k, \langle s, t \rangle \rangle \rangle$ (called BASE), which maps a process and a world of evaluation to the set of worlds at which everything proceeds as it is supposed to for that process.[45] This modal base function is the semantic theory's way of encoding the intuitive idea that with each production process we associate a set of idealized

[44] Note that this talk of being a process which makes a certain sort of object is just an informal, inuitive gloss on one component of the model-theoretic analysis that is to be given momentarily. It is a philosophical interpretation of the analysis, not the analysis itself. Rather than analyzing genericity in terms of the habitual property of 'making things that are *G*,' it analyzes genericity in terms of kinds and the ideal outcomes we associate with them, which are encoded as a kind of modality.

[45] Formally, it has the structure of a bouletic modality, though of course there is no actual volition in this example.

outcomes. Given the nature of the activity of Ferrari production in Maranello, there just is a way that Ferraris are supposed to turn out.

PM will be a function, then, which takes e.g. the property of having a horse crest and makes it into the property of being a production process which creates things with horse crests. Since *PM* has intensional content, we must dispense with our previous extensional framework (adopted to enhance readability), introduce a new atomic type *s* for possible worlds, and define *PM* to be the following function of type $\langle\langle e\langle s,t\rangle,\langle k,\langle s,t\rangle\rangle\rangle$:

(51) **Definition of** ***PM***

$$[\![\mathbf{PM}]\!]^{M,g} = \lambda f_{\langle e,\langle s,t\rangle\rangle} \,.\, \lambda K_k \,.\, \lambda w \,.\, ...$$

$$... \,\forall w'(\textsc{Base}(w)(K_k)(w') \rightarrow \exists x(member(x)(K_k)(w') \wedge f(x)(w')))$$

To phrase the definition more idiomatically, *PM* takes a property of objects f and transforms it into the property of kinds that holds of a kind K just in case at all worlds in which everything goes according to plan for K, some members of K have property f.[46] That makes the analysis under consideration a normality theory (Asher & Pelletier, 1997; Nickel, 2008), but it is a kind-level normality theory, rather than an object-level normality theory. According to the analysis, a generic statement tells us about what is normal for a process of creating things—not about what is normal for the particular things it makes.

Although the intuitive explanation for what a production process is used the example of a physical manufacturing process taking place at a plant, it is important to note the processual perspective on kinds goes far beyond the example of a physical manufacturing process. It applies to any process whatsoever that might be said to make things, and whose products can be assessed in light of the ideals that are associated with it. So, for example, bear-kind can be thought of as

[46] This definition requires that some rather than all members of the kind K have property f to allow for the possibility of production processes that make more than one variety of thing. For instance, the process of Ferrari production at Maranello might have the property of making things that are red, and also have the property of making things that are blue. This further wrinkle in the analysis is not required to cover the data described in this paper, but it is necessary for covering some of the standard examples that are also discussed in the literature, such as sexual dimorphism-related pairs like 'Cattle have horns' and 'Cattle have udders.' To capture the data discussed in this paper, it would be just as well to replace the final existential quantifier with a universal quantifier and the final conjunction with a material implication.

the system of alimentary, respiratory, and reproductive transactions currently taking place among the bear population. It is the evolutionary process responsible for making bears, and the same logic that applied to the process of Ferrari manufacture applies to it. There are ways that the things it produces (i.e. bears) are supposed to come out, although not everything it produces in the actual world infallibly comes out that way. The processual perspective on kinds also applies to social kinds. For example, professor-kind can be thought of as the activity taking place around the world's PhD programs, which are collectively responsible for minting the latest generation of academics. So the intuitive notion of a production process is quite abstract; it applies wherever we can find an activity of making things which are assessed in light of the ideal outcomes we associate with that activity.

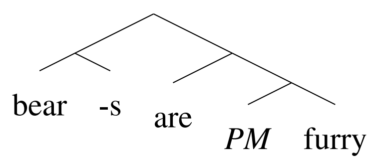
It should also be stressed that one need not buy into the metaphysical picture alluded to above in order to make use of this proposal. The metaphysical picture is nothing more than a tool for making intuitive sense of what phenomena the model-theoretic structures employed by the semantic analysis are supposed to be modelling. Although it is, in this author's opinion, sound theoretical etiquette to couple every proposal in model-theoretic semantics with an intuitive illustration of the ideas underlying it, those intuitive illustrations are not to be confused with the analysis itself, which makes rather few commitments one way or the other about what entities of type k are. Strictly speaking, the metaphysical commitments of this analysis are exhausted by the stipulation that there is an atomic domain corresponding to the atomic type k, that there is a special kind membership relation of type $\langle e, \langle k, \langle s, t \rangle \rangle \rangle$ relating a kind to the entities that are its members, and that a modal base function encodes a set of ideal outcomes for each entity in that domain at each world.

The next operator needed for this analysis was alluded to in section 3.1.2, and maps a property of objects to the kind whose members all have that property, and only whose members have that property. There are many options for where precisely to locate it in the syntax, and no attempt will be made here to defend any particular syntactic analysis. The simplest option for illustrative purposes is to posit a new affix, *-s*, which will combine with the predicate in subject position to yield a kind in the following way:

(52) **Definition of -*s***

$$[\![\textbf{-s}]\!]^{M,g} = \lambda f_{\langle e,\langle s,t\rangle\rangle} \,.\, \iota K_k \,.\, \forall w' \, \forall x(f(x)(w') \leftrightarrow \mathit{member}(x)(K)(w')))$$

That is, -*s* will map the predicate in the subject NP to the unique kind responsible for making everything in its extension, should there be one. When there is no such kind, the predicate in the subject NP is haphazard. So the logical form of a simple bare plural characterizing sentence will turn out to be something like the following:



To enhance readability, the analysis has thus far been laid out in static terms. Although it could incorporate a limited amount of context-sensitivity while remaining static—the lexical entry for -*s* could contain a free variable for a kind, which the variable assignment function *g* could saturate in context—for full-fledged context-sensitivity that allows for the introduction of new kinds into discourse, it will be necessary to move to a dynamic analysis.[47] The lexical entries provided so far yield the result that if there is no kind all of whose members satisfy the predicate in subject position (and vice versa), the relevant generic statement will come out false, rather than infelicitous. For example, sentence (30-a), repeated here, will come out false, because there is no kind whose members all fall under the extension of *topping on this pizza*:

(53) Toppings on this pizza are vegetarian.

If we wish for it to come out infelicitous rather than false, the best approach is to amend the lexical entry in (52) so as to endow it with a familiarity presupposition, and the natural home for

[47] It would go beyond the scope of this paper to consider examples which involve introducing new kinds into discourse, but it will be useful to have a framework that allows for this. For example, chap. 4 of Teichman (2015) argues that a pragmatic accommodation procedure which can introduce new kinds into a discourse offers one possible avenue for explaining the Condoravdi cases.

a presuppositional analysis is a dynamic framework. Going dynamic will also be the ideal way to secure the result that sentences about dobermans can vary in truth or falsity from context to context.[48] The next task, then, is to illustrate how to go from a static to a dynamic analysis.

5.1 Moving to the Discourse Level

There are any number of dynamic frameworks that would serve the purpose of illustrating how a sophisticated kind theory works, but to keep the analysis fully compositional, this paper will adopt the incremental typed logic framework of van Eijck & Kamp (2010).[49] The analysis started off extensional, then became intensional at the moment we required a definition for PM, an intensional operator. The following changes will be necessary to take the third step of lifting the static intensional analysis to the discourse level:

(i) enrich the type system with something that can play the role of information states

(ii) type shift previous lexical entries so that each statement in a discourse gets coded as a shift from state to state, rather than as an intension

(iii) replace the static lexical entry for -*s* with an entry that endows it with a familiarity presupposition

Following Vermeulen (1993) and Dekker (2012), incremental typed logic renders the state of a conversation as a sequence of entities. The type of a sequence of entities is written $[k]$, and variables of this type are written as c, c', c'', etc. A sequence is intended to represent which entities are available to the conversation at any given moment, and each slot of the sequence is intended to play the role of a discourse referent. Although the relevant entities are more familiarly of type e,

48 The static analysis will predict sentences like (53) to be false, and it will predict that generic sentences do not contextually domain restrict. Those who are happy to stop at capturing those data points can stick with the static version of the analysis and skip the following subsection.

49 See in particular the appendix to the second edition. For other presentations of incremental typed logic, see van Eijck (1999) and van Eijck & Unger (2010), chap. 12. This is a close cousin of the theories presented in Groenendijk & Stokhof (1990); Muskens (1996); van Eijck (1997).

for present purposes they need instead be of type k, given that the the examples discussed earlier involve discourse-level sensitivity to *kinds*.

Once a world of evaluation has been contextually supplied, the final step in a static derivation yields a truth value, and the map from the world of evaluation to that truth value is intended to represent the truth conditions of the proposition expressed by the sentence. The corresponding final step in a dynamic derivation yields a state transition, which is intended to represent the change that uttering the relevant sentence would effect in the state of a conversation. Intuitively, a state transition (type $\langle[k],\langle[k],t\rangle\rangle$, which we will alias as T) is a relation on states which maps two states c and c' to 1 (True) at a world of evaluation just in case the meaning encoded by the relation would change a conversation from being in state c to being in state c' at that world of evaluation, and 0 (False) otherwise. To access the entities stored in states, we introduce an atomic type ($\mathbb{N}$) for indices, and help ourselves to the following notation: if c is a conversational state and i is a numerical index, then $c[i]$ is the i^{th} element of c. To draw a distinction between falsity and infelicity, we shift the truth definitions of the logical constants in the metalanguage from those of classical two-valued logic to those of Weak Kleene three-valued logic (Bochvar, 1938), and use # as a symbol for the third truth value, intuitively meant to represent what a statement that is neither true nor false denotes.

Here is a summary of these introductions to the type system:

(54) **Types**

a. $[k]$ - a sequence of entities of type k (variables of type $[k]$ written c, c', c'', etc.), to serve as a stack of discourse referents

b. T - alias for the type $\langle[k],\langle[k],t\rangle\rangle$, a transition between discourse referent states

c. $\mathbb{N}$ - a type for numerical indices

d. $D_t := \{1, 0, \#\}$

To distinguish between at-issue content and presuppositional content, we introduce the δ operator (Beaver, 2001) and define it as follows:

(55) **Presupposition Operator**

$$\|\delta(\phi)\|^{M,g} = \left\{ \begin{array}{ll} 1, & \text{if } \|\phi\|^{M,g} = 1 \\ \#, & \text{otherwise} \end{array} \right\}$$

In order for the final step in the derivation to deliver a state transition, we apply the following lifting operations to the earlier static denotations for object predicates, kind predicates, *PM*, and the kind membership relation:

(56) **Lifting Operations**

a. *Discourse-Level Lift for Kind Predicates of type* $\langle k, \langle s, t\rangle\rangle$ *to type* $\langle \mathbb{N}, \langle s, T\rangle\rangle$

$\nearrow([\![predicate]\!]^{M,g}) = \lambda j_{\mathbb{N}} \,.\, \lambda w \,.\, \lambda c \,.\, \lambda c' \,.\, c = c' \wedge [\![predicate]\!]^{M,g}(c[j])(w)$

b. *Discourse-Level Lift for Object Predicates of type* $\langle e, \langle s, t\rangle\rangle$ to type $\langle e, \langle s, T\rangle\rangle$

$\nearrow([\![predicate]\!]^{M,g}) = \lambda x \,.\, \lambda w \,.\, \lambda c \,.\, \lambda c' \,.\, c = c' \wedge [\![predicate]\!]^{M,g}(x)(w)$

c. *Truth-Conditional Lower for Object Predicates of type* $\langle e, \langle s, T\rangle\rangle$ to type $\langle e, \langle s, t\rangle\rangle$

$\searrow([\![predicate]\!]^{M,g}) = \lambda x \,.\, \lambda w \,.\, \forall c \exists c'([\![predicate]\!]^{M,g}(x)(c)(c')(w))$

d. *Discourse-Level Lift for PM*

$\nearrow([\![\mathbf{PM}]\!]^{M,g}) = \lambda f_{\langle e, \langle s, T\rangle\rangle} \,.\, \nearrow([\![\mathbf{PM}]\!]^{M,g}(\searrow f))$

e. *Discourse-Level Lift for the Kind Membership Relation*

$\nearrow(\|member\|^{M,g}) = \lambda x \,.\, \lambda j_{\mathbb{N}} \,.\, \lambda w \,.\, \lambda c \,.\, \lambda c' \,.\, c = c' \wedge \|member\|^{M,g}(x)(c[j])(w)$

The discourse-level kind-forming operator can then be defined as follows, where *sel*, a function of type $\langle [k], \mathbb{N}\rangle$, operates as a placeholder for the reader's preferred anaphora resolution algorithm (de Groote, 2006):[50]

(57) $[\![\textbf{-s}]\!]^{M,g} = \lambda f_{\langle e, \langle s, T\rangle\rangle} \,.\, \lambda h_{\langle \mathbb{N}, \langle s, T\rangle\rangle} \,.\, \lambda w \,.\, \lambda c \,.\, \lambda c' \,.\, c = c' \wedge ...$

$... \; \delta(\forall x \forall w'(member(x)(sel(c))(w')(c)(c') \leftrightarrow f(x)(w')(c)(c'))) \wedge ...$

$... \; h(sel(c))(w)(c)(c')$

[50] Fully specifying an anaphora resolution algorithm lies outside the scope of this paper, but the author's preferred approach to the problem can be found in Martin & Pollard (2012).

Although the lexical entry in (57) is somewhat cumbersome to parse, the kind-forming operator *-s* is not in fact doing anything particularly complicated. The first conjunct indicates that the truth conditions of a generic will not introduce any additional objects into discourse. The second conjunct tests the conversational state for the existence of a unique contextually salient kind that is responsible for producing everything in the extension of the predicate in subject position. The third conjunct asserts that that contextually salient kind has the property fed to it by *PM* once it has taken the predicate in object position as an argument.

5.2 Capturing the Four Contrasts

The sophisticated kind-theoretic analysis offers the following explanation for the four data points in section 4. Generic statements do not undergo contextual domain restriction, because there is no domain to be restricted. The kind-forming operator *-s* is set up somewhat like a generalized quantifier, but it is really a definite operator, and it is over kinds. So generic statements have a domain in one sense of the term, but it is a domain of kinds, rather than individual objects, and so is not subject to contextual restriction in the same circumstances. As for cohesion, we can say that a predicate is cohesive just in case there is some kind that everything in its extension is a member of, and every member of that kind is in the extension of the predicate:

(58) **Cohesion**

A predicate P is cohesive iff $\exists K_k \forall x(P(x) \leftrightarrow member(x)(K)))$

In this analysis, the atomic type k is meant to encode the idea that certain collections of objects are disjunctive—that they were all created by different processes—whereas other collections of objects are of a piece, because a single process underlies the creation of them all. In ordinary contexts, the participants in a conversation rely on their common stock of knowledge about which groups of objects are disjunctive in this way and which are not, which means that every conversation keeps track of what kinds there are. If a speaker attempts to make a generic statement about a kind whose existence is not presupposed by the common ground of the conversation in which they are participating, then that attempt will be an infelicitous conversational move. Given that in most contexts, the conversational participants do not assume there to be a single kind underlying the creation of toppings on the pizza gestured at by the speaker, sentences like (30-a) typically come out infelicitous. But recherché contexts like the one discussed in section 4.2 can admit even sentences like (30-a), because in those contexts, the assumption that such a kind exists *is* part of the common ground. So the analysis put forth in this section realizes the cohesiveness presupposition as a familiarity condition associated with the kind-forming operator *-s*.

The same mechanism can explain the availability of artifactual interpretations. Suppose that there are two different kinds with the same extension: biological doberman-kind and artifactual doberman-kind. One is the process that makes animals with certain biological properties. The other is the process that grooms certain animals to perform the cultural role of a doberman: guarding, looking threatening, being recognizable as a guard dog, and so forth. One is a process which makes things with floppy ears, and the other is a process which makes things with pointy ears. In some contexts, the *-s* operator will map the predicate *doberman* to the one process responsible for creating everything in its extension, and in other contexts, it will map the predicate *doberman* to the other process responsible for creating everything in its extension. Those two kinds have different properties, and so the sentences about dobermans will vary in truth and falsity across the same circumstances, depending on the conversational context in which they occur.[51]

Given that the sophisticated kind theory neatly explains why D/I co-predications are possible, as was observed in section 4.4, it should now be clear how a sophisticated kind theory can tell a unified story about all four of the data points under discussion. That it can do so speaks rather strongly in its favor.

[51] For more details, see Teichman (2015), chap. 4.

6 Conclusion

We began by asking what the logical form of a generic statement is. Kind theories hold that the bare plural noun phrase in subject position of a generic refers to a kind. Quantificational theories in general hold that generic statements involve an implicit, unpronounced quantifier called *Gen*. Determiner quantificational theories hold that generic statements are ultimately generalizations over individual objects. Adverbial quantificational theories hold that they are ultimately generalizations over things like events, situations, or variable assignments.

Leaving the question whether to opt for the kind-theoretic analysis over the adverbial quantificational analysis to be resolved at a later time, we saw that contrasting generic statements with sentences that contain an overt determiner quantifier threw four semantically distinctive features of generic sentences into relief. Generic sentences do not contextually domain restrict, they require a cohesive predicate in subject position, they are susceptible to artifactual interpretations, and they can occur in D/I co-predications. Though these four features are not necessarily impossible to explain by way of an adverbial quantificational theory, they do put determiner quantificational theories under substantial pressure.

A sophisticated kind-theoretic analysis can provide a satisfying explanation for the presence of these four features. Contextual domain restriction requires a domain, and generic statements involve no domain of individual objects. They require a cohesive predicate in subject position, because the kind-forming operator *-s* maps the predicate in subject position to the kind responsible for making everything in its extension, where there is such as contextually salient kind, and crashes the derivation, where there is not. They allow for artifactual interpretations when the artifactual kind responsible for making everything in the extension of the predicate in subject position is contextually salient, and allow for non-artifactual interpretations when some other kind is contextually salient. And they allow for D/I co-predications because the output of the predicate modifying operation is a predicate just like any other.

This is why the sophisticated kind theory deserves to remain a contender for a fully compositional analysis of generic statements, despite the fact that it has largely been left behind by the literature. The standard objections against kind theories do not apply to it, and it exhibits real explanatory power in the face of subtle variation in truth conditions across different contexts. Perhaps it ought to be given a second look.

Acknowledgments

This project originated out of a conversation with Itamar Francez, who jumpstarted it with astute observations about some interesting linguistic data. Jason Bridges, Chris Kennedy, and Malte Willer deserve special thanks for their integral role in shaping the larger body of research of which this paper forms a part. The two anonymous peer reviewers at *Inquiry* made deep and interesting suggestions about how to reformulate the main argument of the paper, and these were happily taken up. I am grateful to John Collins for encouraging me to emphasize the data on co-predication. Julian Grove was incredibly helpful when it came to bug checking the final version of the analysis. Finally, the participants in the 2015 *Genericity* conference at Harvard University, including Alex Anthony, Kristina Gerhman, Michael Glanzberg, Sally Haslanger, Samia Hesni, James Kirkpatrick, Dimitra Lazaridou-Chatzigoga, Joseph Milburn, Paul Nichols, Bernhard Nickel, Jennifer Saul, Rachel Sterken, Preston Stovall, and Ravi Thakral, offered no shortage of useful feedback.

References

Alonso-Ovalle, Luis. 2006. *Disjunction in alternative semantics*. Ph.D. thesis, University of Massachusetts Amherst.

Aquinas, Thomas. 1947. *Summa Theologica*. Benzinger Brothers. Translated by Fathers of the English Dominican Province.

Aristotle. 1948. *Metaphysics: a revised text with introduction and commentary*. Clarendon Press. Translated by W. D. Ross.

Asher, Nicholas, & Bonevac, Daniel. 2005. Free Choice Permission is Strong Permission. *Synthese*, **145**(3), 303–323.

Asher, Nicholas, & Morreau, Michael. 1995. What Some Generic Sentences Mean. *Pages 300–338 of:* Carlson, Gregory, & Pelletier, Francis Jeffrey (eds), *The Generic Book*. Chicago University Press.

Asher, Nicholas, & Pelletier, Francis Jeffrey. 1997. Generics and Defaults. *Pages 1125–1179 of:* van Benthem, Johan, & ter Meulen, Alice (eds), *Handbook of Logic and Language*. MIT Press.

Barker, Chris. 2010. Free choice permission as resource-sensitive reasoning. *Semantics and Pragmatics*, **3**(10), 1–38.

Barwise, John, & Cooper, Robin. 1981. Generalized Quantifiers and Natural Language. *Linguistics and Philosophy*, **4**(2), 159–219.

Beaver, David I. 2001. *Presupposition & Assertion in Dynamic Semantics*. Stanford: CSLI Publications.

Bochvar, D. A. 1938. On a Three-Valued Logical Calculus and its Application to the Analysis of the Paradoxes of the Classical Extensional Calculus. *Matematiceskij Sbornik*, **4**(46), 287–308.

Carlson, Gregory N. 1977a. *Reference to Kinds in English*. Ph.D. thesis, University of Massachusetts, Amherst.

Carlson, Gregory N. 1977b. A Unified Analysis of the English Bare Plural. *Linguistics and Philosophy*, **1**(3), 413–458.

Carlson, Gregory N. 1982. Generic Terms and Generic Sentences. *Journal of Philosophical Logic*, **11**(2), 145–181.

Chierchia, Gennaro. 1998. Reference to Kinds Across Languages. *Natural Language Semantics*, **6**(4), 339–405.

Chomsky, Noam. 1965. *Aspects of the Theory of Syntax*. M.I.T. Press.

Church, Alonzo. 1940. A Formulation of the Simple Theory of Types. *The Journal of Symbolic Logic*, **5**(2), pp. 56–68.

Cohen, Ariel. 2001. On the Generic Use of Indefinite Singulars. *Journal of Semantics*, **18**(3), 183–209.

Cohen, Ariel. 2013. Genericity. *In:* Aloni, Maria, & Dekker, Paul (eds), *Cambridge Handbook of Semantics*. Camb.

Condoravdi, Cleo. 1992. Strong and Weak Novelty and Familiarity. *In:* Barker, Chris, & Dowty, David (eds), *Proceedings of SALT*. Cornell.

Condoravdi, Cleo. 1997. *Descriptions in Context*. Outstanding Dissertations in Linguistics. Garland Publishing, Incorporated.

Dahl, O. 1975. On Generics. *Pages 99–111 of:* Keenan, E. L. (ed), *Formal Semantics of Natural Language*. Cambridge: Cambridge University Press.

Dahl, Osten. 1995. The Marking of the Episodic/Generic Distinction in Tense-Aspect Systems. *In: The Generic Book*. The University of Chicago Press.

de Groote, Philippe. 2006. Towards a Montagovian Account of Dynamics. *Semantics and Linguistic Theory*, **16**(0), 1–16.

Dekker, P.J.E. 2012. *Dynamic Semantics*. Studies in linguistics and philosophy. Springer London, Limited.

Fara, Michael. 2001. *Dispositions and Their Ascriptions*. Ph.D. thesis, Princeton University.

Farkas, Donka F., & Sugioka, Yoko. 1983. Restrictive If/When Clauses. *Linguistics and Philosophy*, **6**(2), 225–258.

Fox, Danny. 2007. Free Choice and the theory of Scalar Implicatures. *In: Presupposition and Implicature in Compositional Semantics*. Palgrave Studies in Pragmatics, Language and Cognition. London: Palgrave Macmillan.

Gamut, L. T. F. 1991. *Logic, Language, and Meaning, Volume 2: Intensional Logic and Logical Grammar*. University of Chicago Press.

Geach, P. T. 1961. Aquinas. *In:* Geach, P.T. & Anscombe, G. E. M. (ed), *Three Philosophers*. Basil Blackwell.

Geach, P.T. 1980. *Reference and Generality: An Examination of Some Medieval and Modern Theories*. Contemporary philosophy series. Cornell University Press.

Gelman, Susan A., Leslie, Sarah-Jane, Was, Alexandra M., & Koch, Christina M. 2015. Children's interpretations of general quantifiers, specific quantifiers and generics. *Language, Cognition and Neuroscience*, **30**(4), 448–461.

Greenberg, Yael. 2003. *Manifestations of Genericity*. Outstanding Dissertations in Linguistics Series. Taylor & Francis.

Groenendijk, Jeroen, & Stokhof, Martin. 1990. Dynamic Montague Grammar. *In:* Kalman, L., & Polos, L. (eds), *Proceedings of the Second Symposium on Logic and Language*. 3–48.

Gupta, Anil. 1980. *The Logic of Common Nouns: An Investigation in Quantified Modal Logic*. Yale University Press.

Heim, Irene. 1982. *On the Semantics of Definite and Indefinite Noun Phrases*. Ph.D. thesis, University of Massachusetts at Amherst.

Heim, Irene, & Kratzer, Angelika. 1998. *Semantics in Generative Grammar*. Wiley-Blackwell.

Hendriks, Herman. 1988. Type Change in Semantics: The Scope of Quantification and Coordination. *In:* van Benthem, Johan, & Klein, Ewan (eds), *Categories, Polymorphism, and Unification*. ITLI.

Klecha, Peter. 2011. Optional and obligatory modal subordination. *In:* Ingo Reich, Eva Horch, Dennis Pauly (ed), *Proceedings of Sinn & Bedeutung 15*. Saarbrücken, Germany: Universaar – Saarland University Press.

Kratzer, Angelika. 1981. The notional category of modality. *Pages 38–74 of:* Eikmeyer, H.-J., & Rieser, H. (eds), *Words, Worlds, and Context*. de Gruyter.

Krifka, Manfred. 1988. The Relational Theory of Genericity. *In: Genericity in Natural Language: Proceedings of the 1988 Tübingen Conference*.

Krifka, Manfred. 2013. Definitional Generics. *In:* Mari, Alda, Beyssade, Claire, & Del Prete, Fabio (eds), *Genericity*. Oxford University Press.

Krifka, Manfred, Pelletier, Francis Jeffry, Carlson, Gregory, ter Meulen, Alice, Chierchia, Gennaro, & Link, Godehard. 1995. Genericity: An Introduction. *In:* Gregory Carlson, Francis Jeffry Pelletier (ed), *The Generic Book*. The University of Chicago Press.

Leiß, Hans. 1991. Polymorphic Constructs in Natural and Programming Languages. *In:* van Eijck, Jan (ed), *Logics in AI*. Lecture Notes in Artificial Intelligence. Springer-Verlag.

Leslie, Sarah-Jane. 2015. Generics Oversimplified. *Noûs*, **49**(1), 28–54.

Lewis, David. 1975. Adverbs of quantification. *Pages 3–15 of: Formal Semantics of Natural Language*. Cambridge University Press.

Lewis, David. 1979. Scorekeeping in a Language Game. *Journal of Philosophical Logic*, **8**(1), 339–359.

Liebesman, David. 2011. Simple Generics. *Noûs*, **45**(3), 409–442.

Lowe, E.J. 2009. *More Kinds of Being: A Further Study of Individuation, Identity, and the Logic of Sortal Terms*. Wiley.

Martin, Scott, & Pollard, Carl. 2012. *Hyperintensional Dynamic Semantics*. Berlin, Heidelberg: Springer Berlin Heidelberg. Pages 114–129.

May, Robert. 1977. *The Grammar of Quantification*. Ph.D. thesis, Massachusetts Institute of Technology.

Milsark, Gary. 1974. *Existential Sentences in English*. Ph.D. thesis, Massachusetts Institute of Technology.

Montague, Richard. 1973. The Proper Treatment of Quantification in Ordinary English. *In:* Hintikka, J., Moravcsik, J. M. E., & Suppes, P. (eds), *Approaches to Natural Language*. Synthese Library, vol. 49. Dordrecht: Reidel.

Muskens, Reinhard. 1996. Combining Montague Semantics and Discourse Representation. *Linguistics and Philosophy*, **19**(2), 143–186.

Nickel, Bernhard. 2008. Generics and the Ways of Normality. *Linguistics and Philosophy*, **31**(6), 629–648.

Nickel, Bernhard. 2010a. Generic Comparisons. *Journal of Semantics*, **27**(2), 207–242.

Nickel, Bernhard. 2010b. Generically Free Choice. *Linguistics and Philosophy*, **33**(6), 479–512.

Roberts, Craige. 1989. Modal Subordination and Pronominal Anaphora in Discourse. *Linguistics and Philosophy*, **12**(6), 683–721.

Roelofsen, Floris. 2008. *Anaphora Resolved*. Ph.D. thesis, ILLC, University of Amsterdam.

Schönfinkel, M. 1924. Über die Bausteine der mathematischen Logik. *Mathematische Annalen*, **92**, 305–316.

Schubert, Lenhart K., & Pelletier, Francis Jeffry. 1987. Problems in Representing the Logical Form of Generics, Bare Plurals, and Mass Terms. *Pages 387–453 of:* Lepore, Ernest (ed), *New Directions in Semantics*. Academic Press.

Shieber, Stuart. 1992. *Constraint-based Grammar Formalisms: Parsing and Type Inference for Natural and Computer Languages*. MIT Press.

Stalnaker, Robert C. 1970. Pragmatics. *Synthese*, **22**(1-2), 272–289.

Stanley, Jason, & Szabó, Zoltán Gendler. 2000. On Quantifier Domain Restriction. *Mind & Language*, **15**(2/3), 219–262.

Sterken, Rachel. 2015. Generics in Context. *Philosophers' Imprint*, **15**(21), 1–30.

Sterken, Rachel. forthcoming. *Generic, Covert Structure, and Logical Form*. Forthcoming in *Mind and Language*.

Strawson, P. F. 1959. *Individuals: An Essay in Descriptive Metaphysics*. Routledge.

Teichman, Matt. 2015. *Characterizing Kinds: A Semantics for Generic Sentences*. Ph.D. thesis, University of Chicago.

van Eijck, Jan. 1997. Typed Logics with States. *Logic Journal of the IGPL*, **5**(5), 623–645.

van Eijck, Jan. 1999. On the proper treatment of context in NL. *In: Computational Linguistics in the Netherlands 1999, Selected Papers from the Tenth CLIN Meeting, December 10, OTS Utrecht*.

van Eijck, Jan, & Kamp, Hans. 2010. Discourse Representation in Context. *Pages 181–252 of:* van Benthem, Johan, & ter Meulen, Alice (eds), *Handbook of Logic and Language, Second Edition*. MIT Press.

van Eijck, Jan, & Unger, Christina. 2010. *Computational Semantics with Functional Programming*. 1st edn. New York, NY, USA: Cambridge University Press.

Veltman, Frank. 2005. Making Counterfactual Assumptions. *Journal of Semantics*, **22**(2), 159–180.

Vermeulen, C. F. M. 1993. Sequence Semantics for Dynamic Predicate Logic. *Journal of Logic, Language and Information*, **2**(3), 217–254.

von Fintel, Kai. 1994. *Restrictions on Quantifier Domains*. Ph.D. thesis, MIT.

Wiggins, David. 2002. *Sameness and Substance Renewed*. Cambridge University Press.